Semi-Annual Progress Report No. 1

"Rocket Studies of the Lower Ionosphere During the IQSY"

Grant Number NsG-511

Period Covered: October 1, 1963 - March 31, 1964

Submitted to
National Aeronautics and Space Administration
Washington 25, D. C.

S. A. Bowhill, Principal Investigator

Aeronomy Laboratory
Department of Electrical Engineering
University of Illinois
Urbana, Illinois

I. Introduction

This grant is for study and experiment pertaining to the D- and E-regions of the ionosphere, as part of the United States program for the International Years of the Quiet Sun.

II. Work Accomplished to Date

During the period covered by this report, laboratory facilities were acquired and personnel hired for the design, construction and operation of vertical incidence sounding equipment for ionospheric studies. A study of ionospheric sounding techniques was made as a guide to the design of a system suited to our research.

A temporary field station was constructed in a rural area near Bondville, Illinois, for the testing of sounding equipment as it was designed and constructed. A site was prepared for an equipment van and field power generating equipment. Antenna towers were erected for the testing of the proposed antenna system.

Construction and field-testing of an experimental sounding system has been completed. An experimental fixed-frequency low-noise transistorized receiver was designed and constructed and has been in operation for several months at the field station. All improvements and modifications necessary to meet the requirements of the system have been made and incorporated into a final version of the receiver.

An experimental pulse transmitter with associated control circuitry was constructed and field tested. An improved version of this transmitter has been developed for use at the NASA Wallops Island field station.

A transmitting antenna array, along with the necessary impedance matching networks and feedlines has been constructed at the Bondville field station. It has been adjusted to radiate the desired circularly-polarized signal. A small receiving antenna has also been designed and tested.

The Bondville station has been operated over a six-week period for the measurement of E-layer absorption. Data obtained during this period is presently being analyzed.

Preparations are now being made for installation of the ionospheric sounding system at Wallops Island, Virginia. Antenna supporting masts have been installed for the transmitting array, a receiving array has been designed, and materials have been procured for its construction. The sounding receiver and transmitter with associated equipment have been shipped to Wallops Island and will be installed prior to rocket launchings scheduled to take place in April, 1964.

An investigation of the characteristics of rocket-borne DC and impedance-measuring probes for direct measurement of electron densities in the upper atmosphere has been initiated. A considerable amount of theoretical work has been done and results are now being compared to available experimental data. Preparations are being made for laboratory facilities to be used in experimental investigation of these and similar types of probes.

A proposal that the ionospheric sounding experiments be included on the NASA mobile launch program in the fall of 1964 has been approved. The design of suitable antennas for shipboard use is currently being investigated.